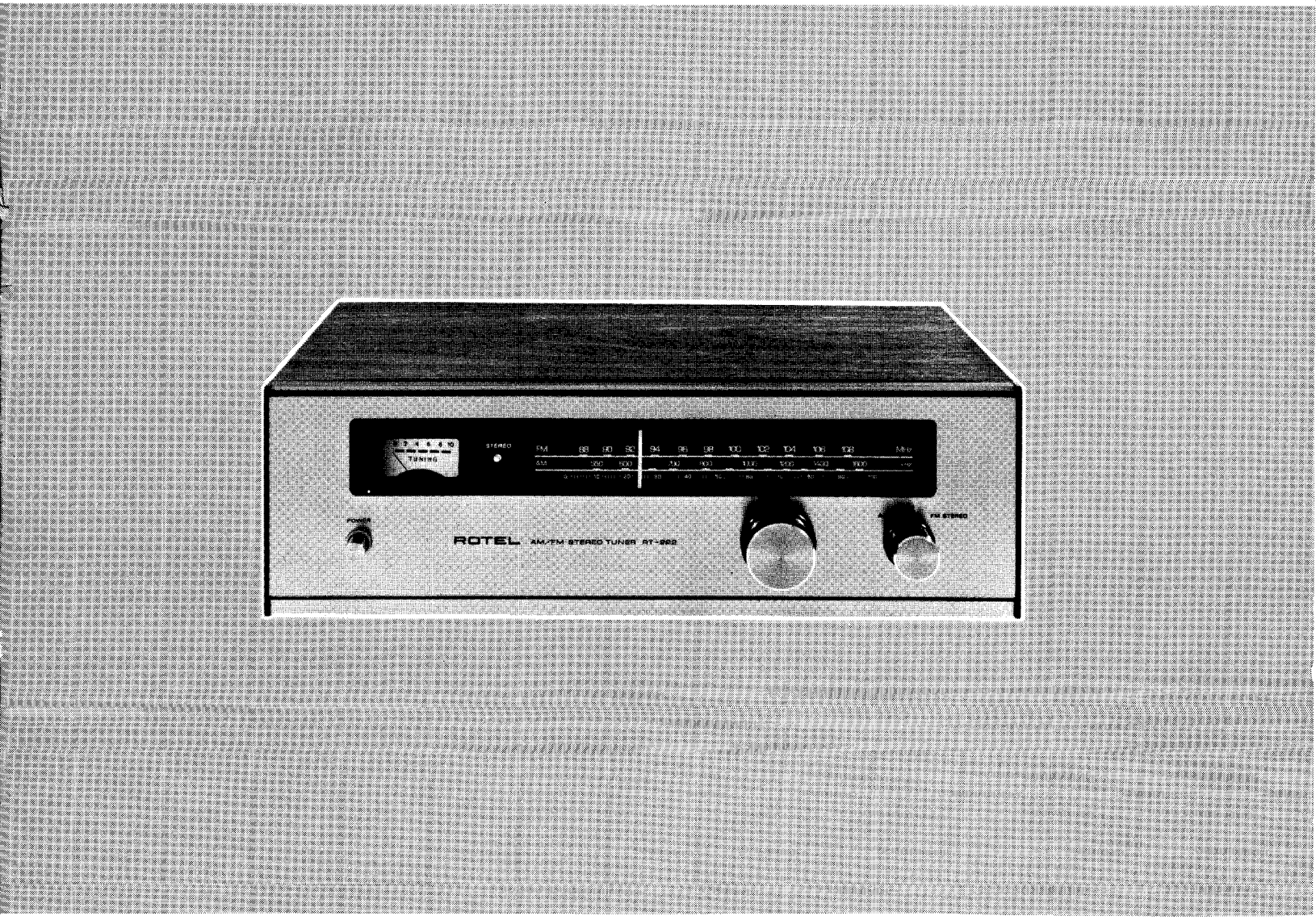
ROTEL®

RT-222

AM/FM STEREO TUNER



technical manual

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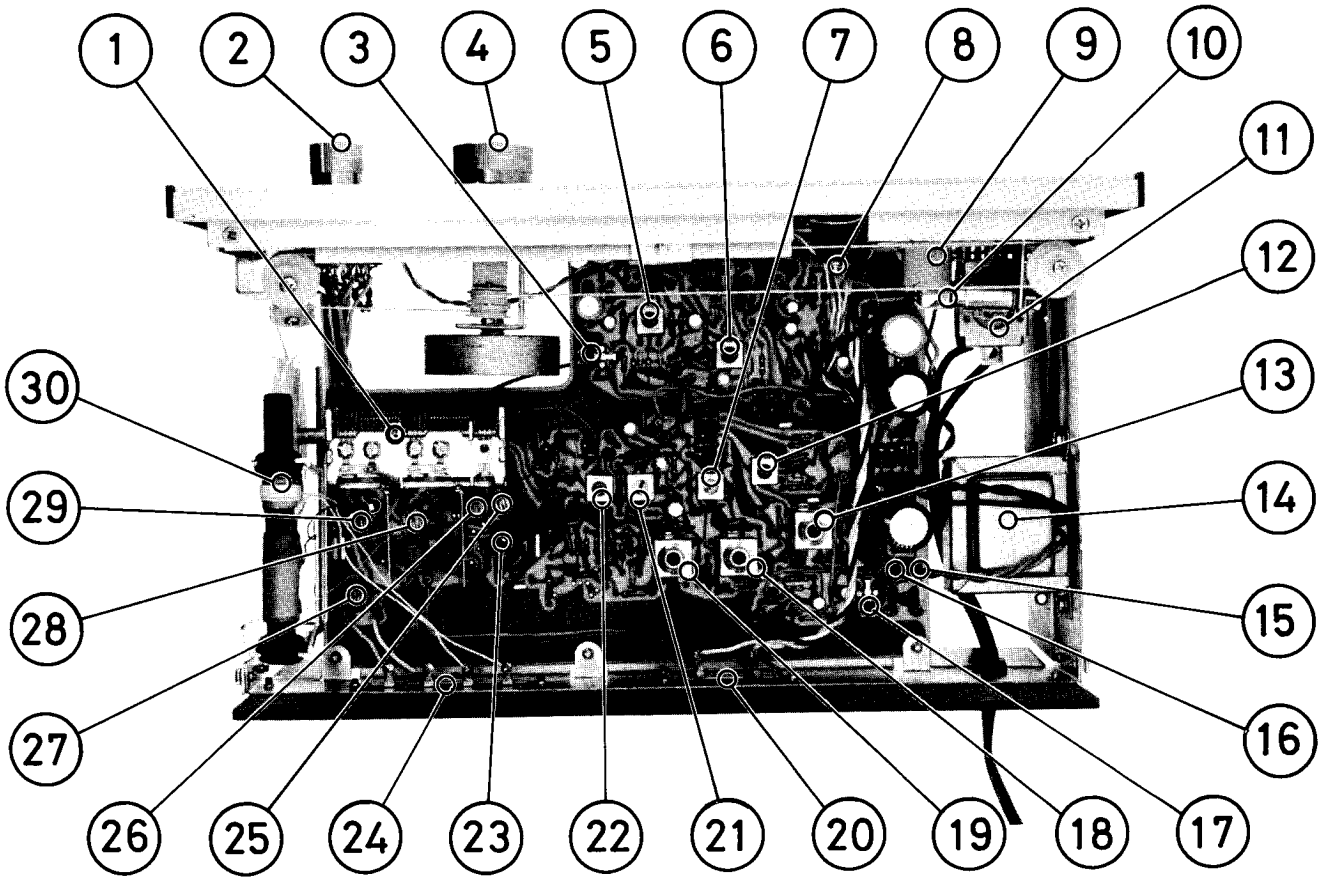
CHASSIS LAYOUT



1. Variable Capacitor, AM/FM Tuning
2. Selector Switch
3. VR301, FM Separation Adj.
4. Tuning Knob
5. L302, MPX. Coil, 19KHz Tune
6. L303, MPX. Coil, 38KHz Tune
7. T105, AM 2nd IFT
8. PL5, FM Stereo Indicator
9. M1, Tuning Meter
10. PL4, Meter Lamp
11. S2, Power Switch
12. T106, AM 3rd IFT
13. T103, FM IFT, Ratio
14. T001, Power Transformer
15. D903, Rectifier
16. D902, Rectifier
17. VR101, FM Meter Level Adj.
18. T102, FM 3rd IFT
19. T101, FM 2nd IFT
20. Output Jack
21. T104, AM 1st IFT
22. L101, AM OSC Coil
23. L7, FM 1st IFT
24. Antenna Terminal Strip
25. L6, FM OSC Coil
26. CT3, FM OSC Trimmer Capacitor
27. L1, FM Antenna Matching Coil
28. L3, FM RF Coil
29. L2, FM Antenna Coil
30. L001, AM Antenna Coil

AM ALIGNMENT PROCEDURE

Instruments: AM Signal Generator and AC VTVM.

NOTES: Set Selector switch to AM Position.

Input signal must be kept as low as possible to avoid AVC action.

Step	Generator		Tuning Dial Setting	Output Indicator Connected to	Adjust	Adjust for
	Coupling	Frequency				
1	AM Antenna Terminals	455 KHz (400 Hz 30% mod.)	Non interfering at low end of scale.	AC VTVM to OUTPUT jack (Left or Right)	T106, 105 and 104	Maximum reading on VTVM.
2		600 KHz (400 Hz 30% mod.)	600 KHz		L101 (OSC) & L001 (ANT) Coil	
3		1400 KHz (400 Hz 30% mod.)	1400 KHz		CT5 (OSC) & CT4 (ANT)	
4	Repeat steps 2 and 3 until no further improvement is noticed.					

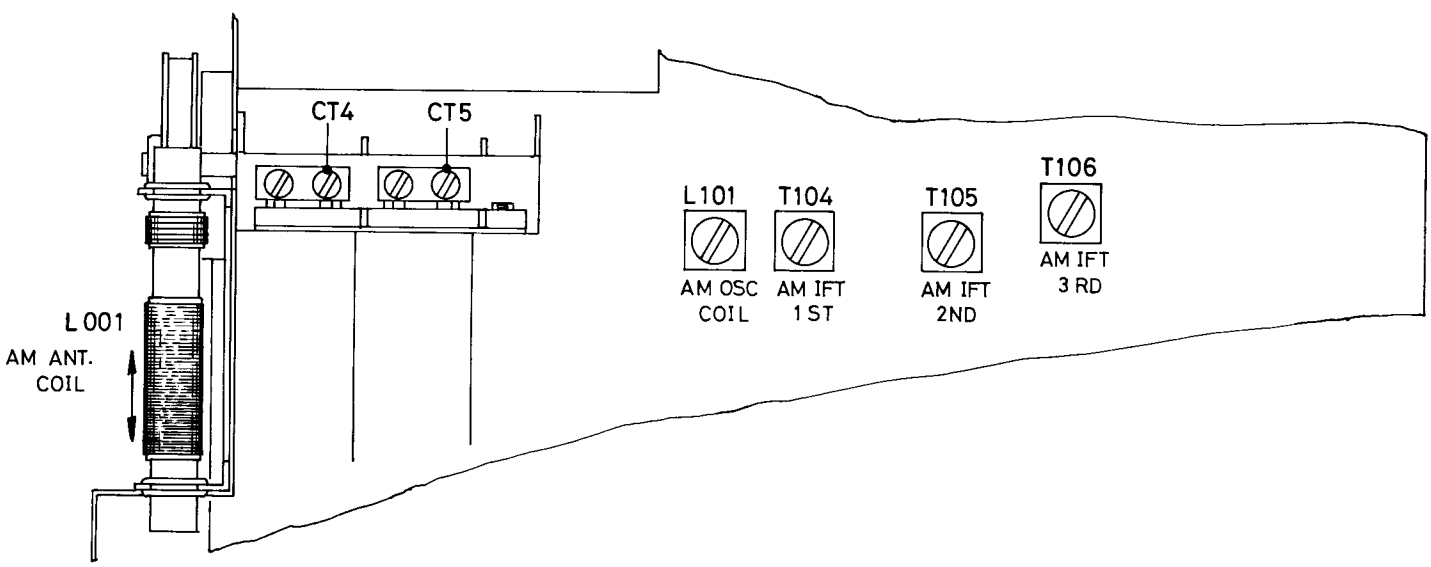


Figure 1. Chassis Top View AM Portion

FM IF & RF ALIGNMENT PROCEDURE

Instruments: FM Sweep Generator, FM Signal Generator, AC VTVM and Oscilloscope.

NOTE: Set Selector switch to FM Position.

Step	Generator		Tuning Dial Setting	Output Indicator Connected to	Adjust	Adjust for
	Connected to	Frequency				
1	FM Sweep Generator to Q101 Base thru a 0.01mfd Capacitor	10.7 MHz	Quiet point on band	Oscilloscope to Pin No. 8 (on IF board)	T103, 102 & 101 Top and Bottom	Maximum and Balanced S curve on scope.
2	Disconnect FM Sweep Generator and connect FM Signal Generator to FM antenna terminals.					
3	FM Signal Generator to FM antenna terminals.	98 MHz (400 Hz 100% Mod.)	Tune for maximum OUTPUT point.	Oscilloscope and AC VTVM. to OUTPUT jack (Left or Right)	L7, Top & Bottom Touch up T101, 102 and 103 if necessary.	Maximum and undistorted amplitude on scope.
4		90 MHz (400 Hz 100% Mod.)	90 MHz		L6 (OSC), L3 (RF) & L2 (ANT)	Maximum reading on VTVM.
5		106 MHz (400 Hz 100% Mod.)	106 MHz		CT3 (OSC), CT2 (RF) & CT1 (ANT)	
6	Repeat steps 4 and 5 until no further improvement is noticed.					

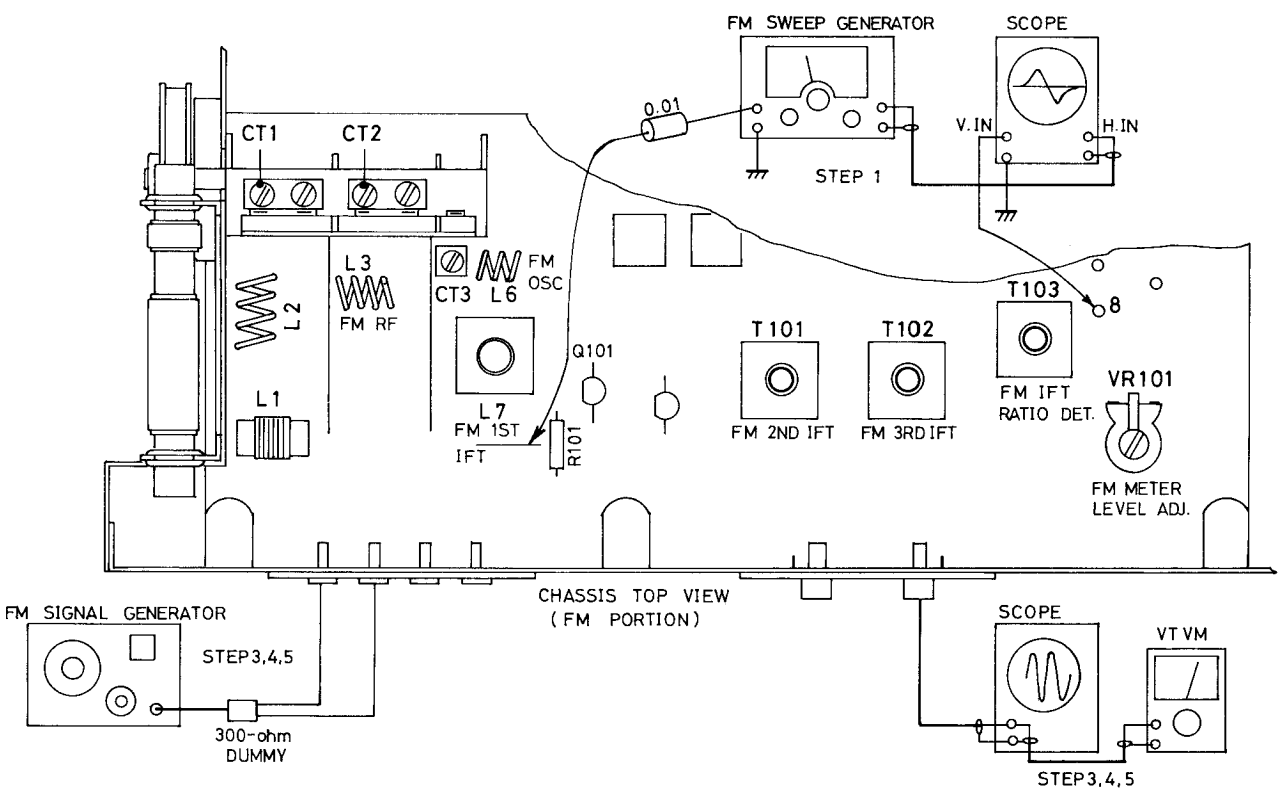


Figure 2. FM IF & RF Alignment Hook-up

FM-STEREO ALIGNMENT PROCEDURE

Instruments: FM Signal Generator, AC VTVM and Oscilloscope.

NOTE: The FM IF Amplifier Alignment must be completed before attempting this FM-Stereo Alignment. Poor IF alignment will result in poor FM-Stereo Alignment.

Set Separation Adj. VR301 to mid-position.

Set Selector Switch to FM STEREO.

Connect Stereo Generator to FM antenna terminals.

Step	Stereo Generator		Output Indicator Connected to	Adjust	Adjust for
	Modulation	RF Deviation			
1	19 KHz Pilot signal only	2 – 5%	Oscilloscope to Test Point	L302 and 303	Maximum Amplitude on scope.
2	Composite 1 KHz signal to Left channel only	Pilot 10% Signal 70%	Oscilloscope & VTVM to Left channel OUTPUT (Pin No. 14)	L302	Maximum and undistorted sine wave on scope.
3			Oscilloscope & VTVM to Right channel OUTPUT (Pin No. 15)	VR301	Minimum reading on VTVM.
4	Composite 1 KHz signal to Right channel only		Same as in step 2.		
5	Repeat steps 3 and 4 until no further improvement is noticed.				

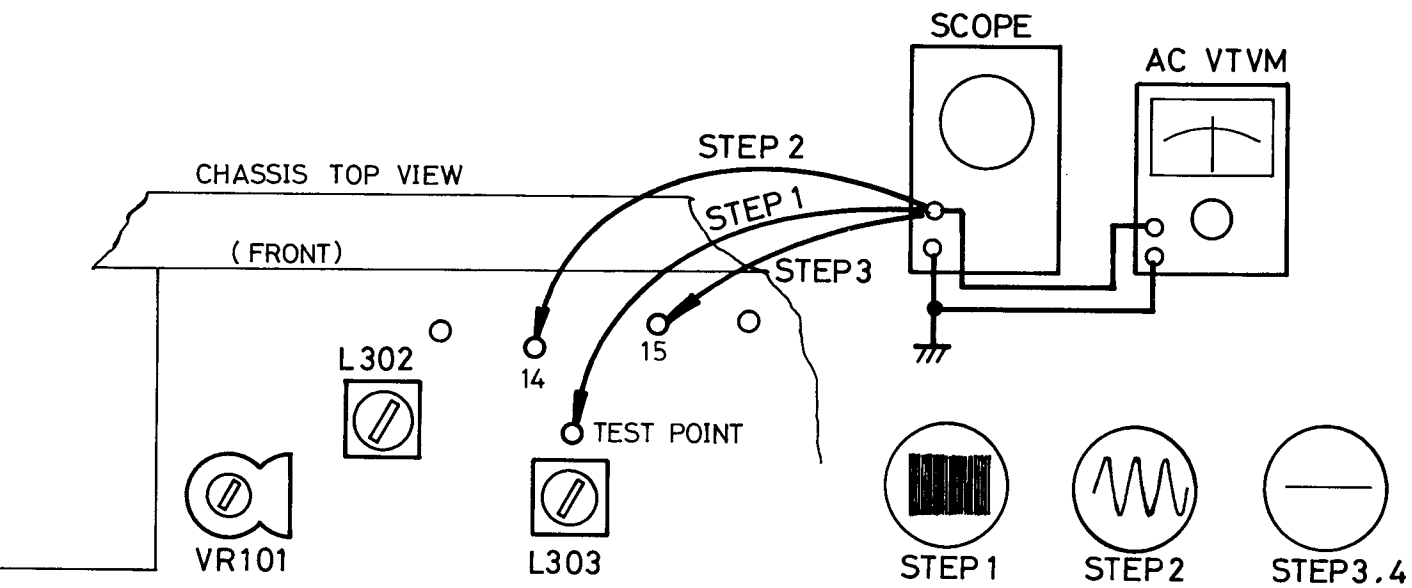


Figure 3. FM STEREO Alignment Hook-up

TROUBLE SHOOTING

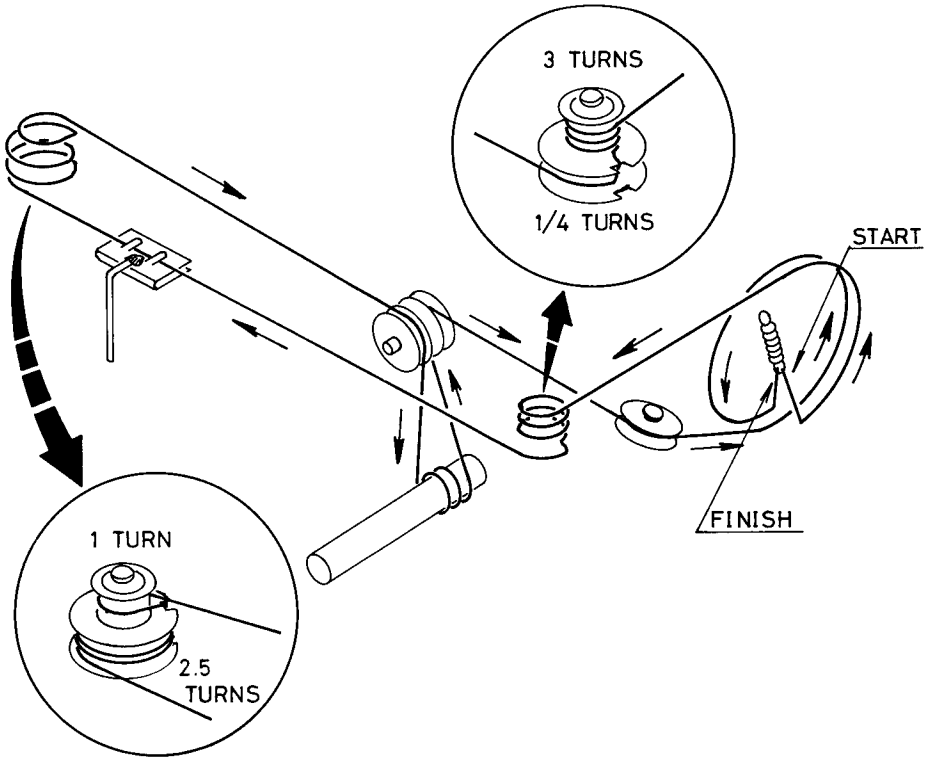
I. Both AM and FM are inoperative.
  A. Measure Voltage at B1 (refer to circuit diagram).
    1. If there is no voltage at B1,
      a. Power Transformer may be faulty
  B. If B1 Voltage is OK, then, measure voltage at B2.
    1. If there is no voltage at B2,
      a. Capacitor, C141 or 142 may be faulty, or
      b. Zener Diode, D901 may be faulty.
    2. If there is proper voltage at B2,
      a. Transistor, Q103 or 104 may be faulty, or
      b. Func. switch connection may be faulty, or
      c. Wire to the Func. switch may be broken.

II. Only AM is inoperative.
  A. Measure voltage at b7.
    1. If there is no voltage at b7,
      a. Func. switch connection may be faulty, or
      b. Wire from Func. switch may be broken
    2. If there is proper voltage,
      a. Transistor, Q105 may be faulty, or
      b. Capacitor, C123 or 126 may be faulty, or
      c. Coil, L001 or 101 may be faulty, or
      d. AM IFT, T104 or 106 may be faulty.

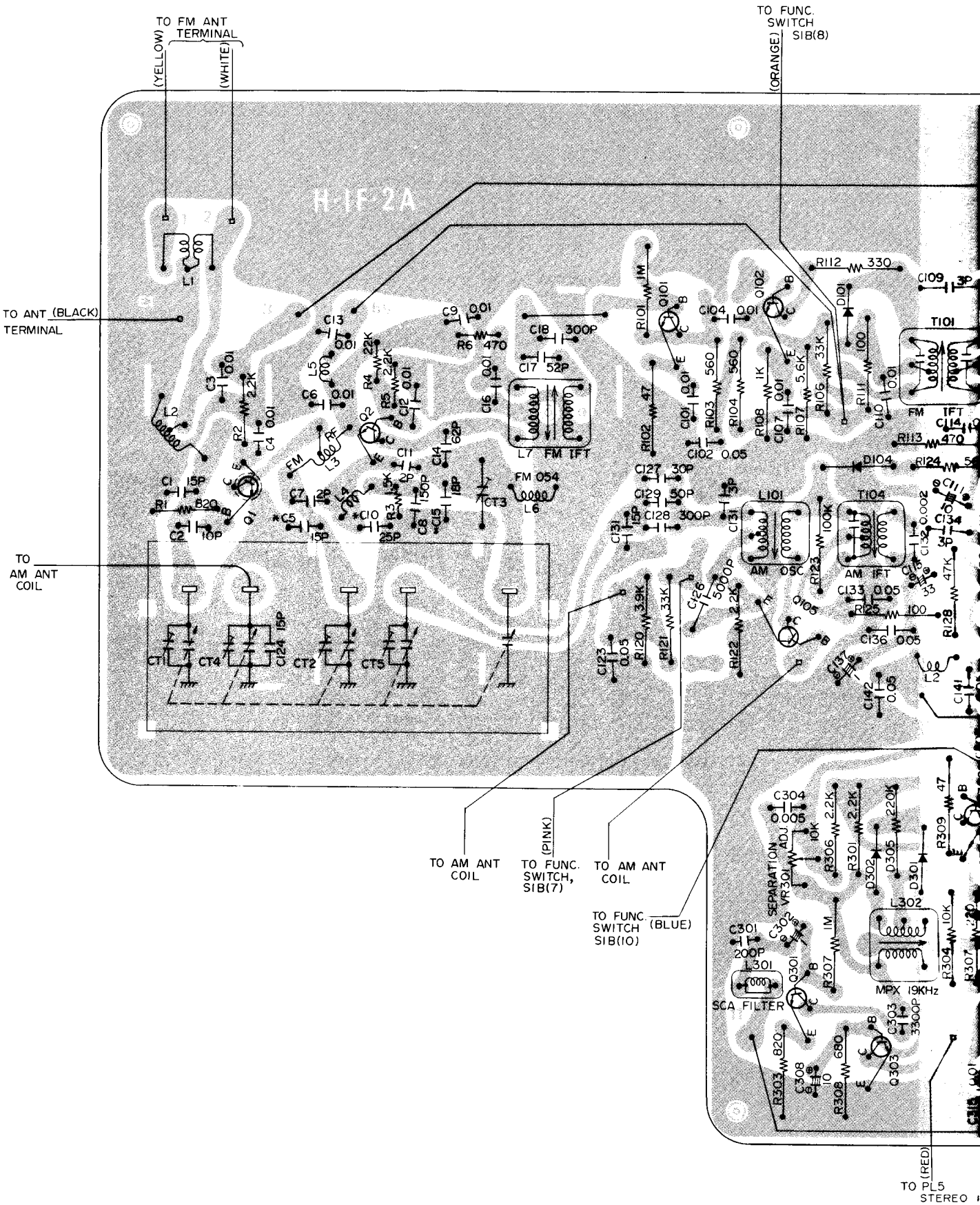
III. Only FM is inoperative.
  A. Measure voltage at B4.
    1. If there is no voltage at B4,
      a. Capacitor, C6, 9 or 13 may be shorted out, or
      b. Func. switch connection may be faulty.
  B. If B4 voltage is OK, then, check to see if there is signal at Pin No. 11.
    1. If there is no signal at Pin No. 11,
      a. Transistor, Q1, 2, 101 or 102 may be faulty, or
      b. FM IFT, L7, T101 or 103 may be faulty.
    2. If there is signal,
      a. Coil, L301 or 302 may be faulty, or
      b. Transistor, Q301 may be faulty, or
      c. Capacitor, C302 or 306 may be faulty.

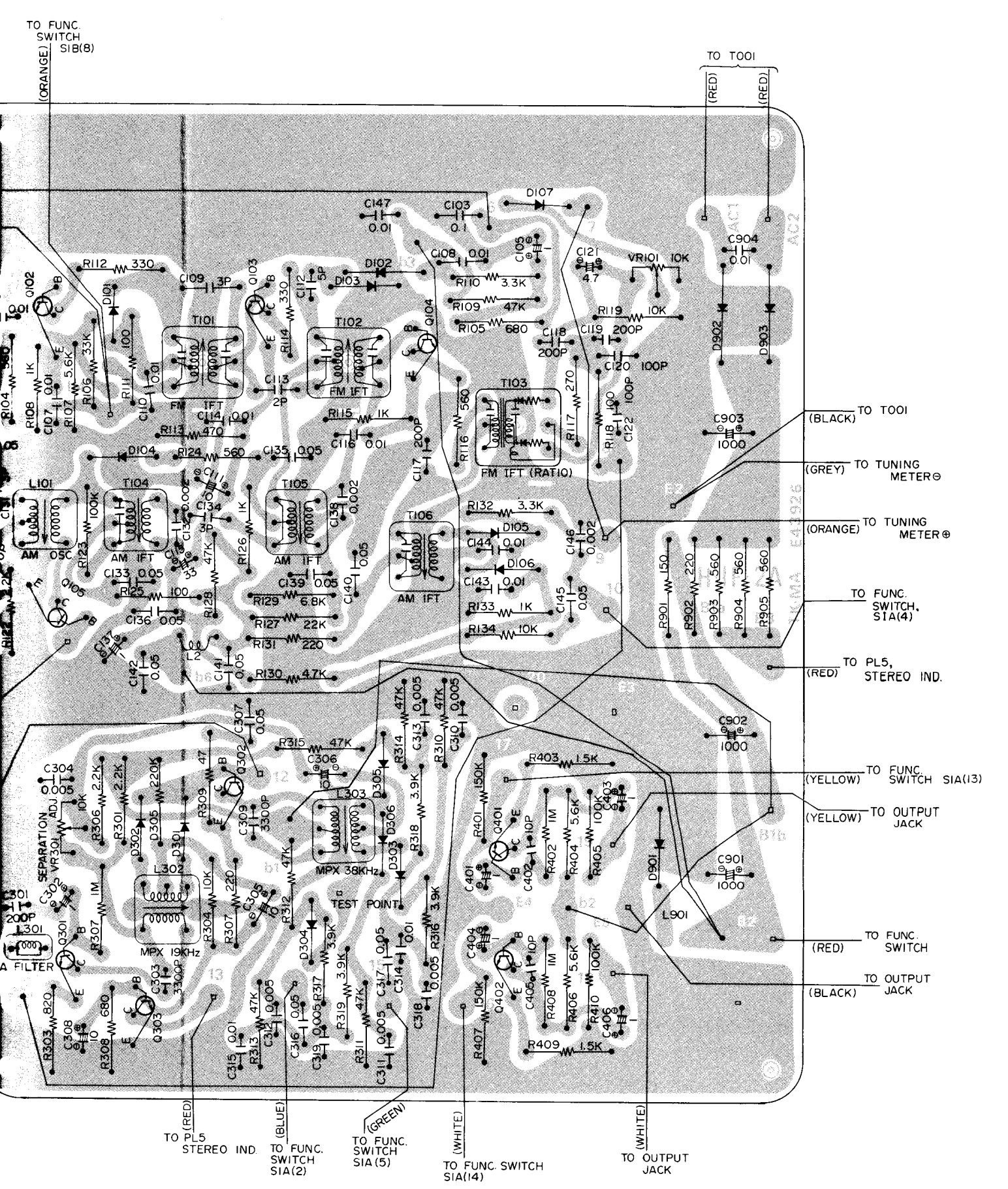
IV. FM MPX is inoperative.
  A. Has no separation, then
    1. Transistor, Q302 may be faulty, or
    2. Coil, L302 or 303 may be faulty, or
    3. MPX alignment may be wrong.
  B. Stereo Indicator does not light, then
    1. Stereo Indicator Lamp may be faulty, or
    2. Transistor, Q303 may be faulty.
  C. Stereo Indicator stays lighted when signal changes to Mono.
    1. Transistor, Q303 may be faulty (shorted out).

DIAL STRINGING DIAGRAM

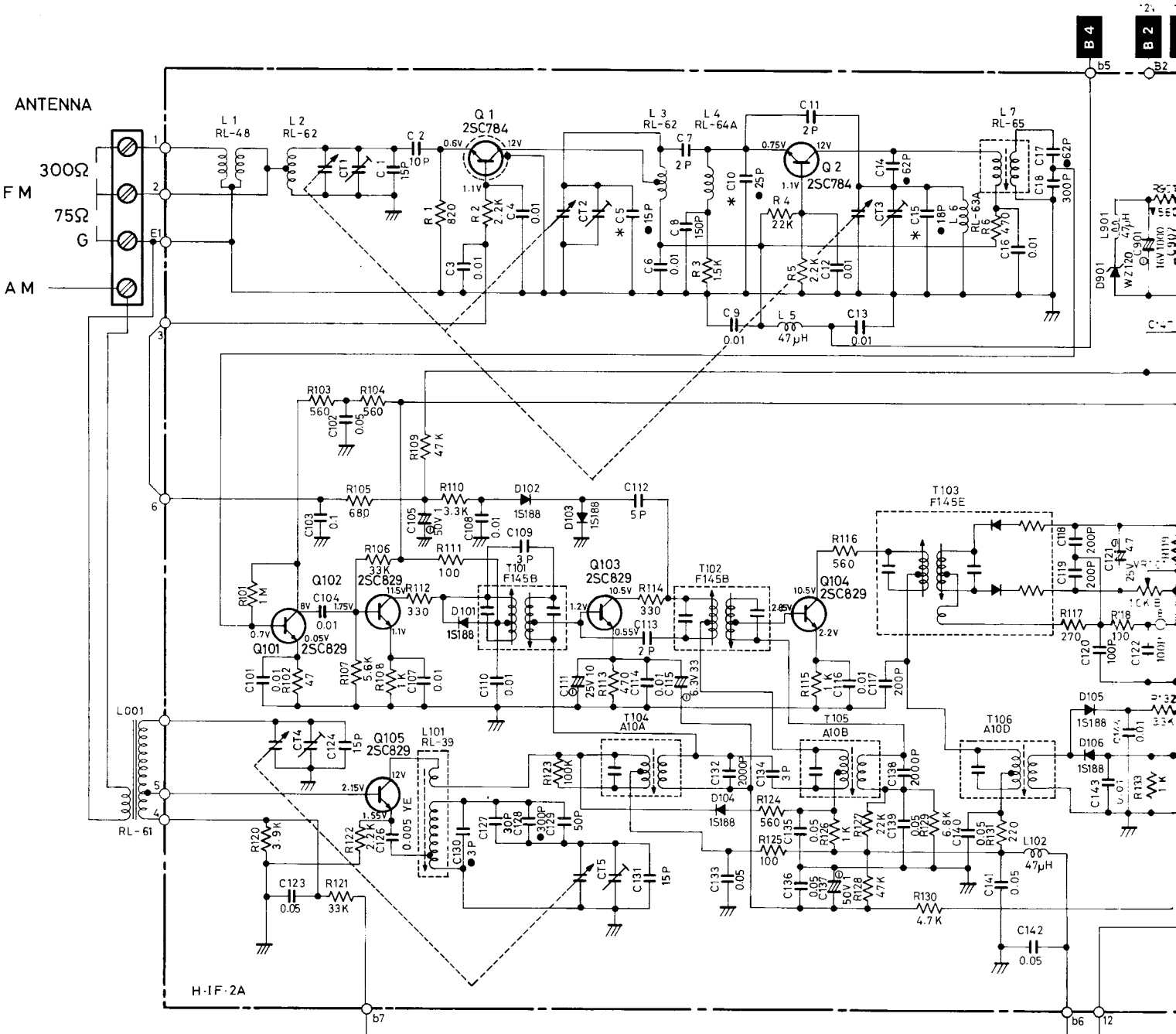


CIRCUIT BOARD DIAGRAM



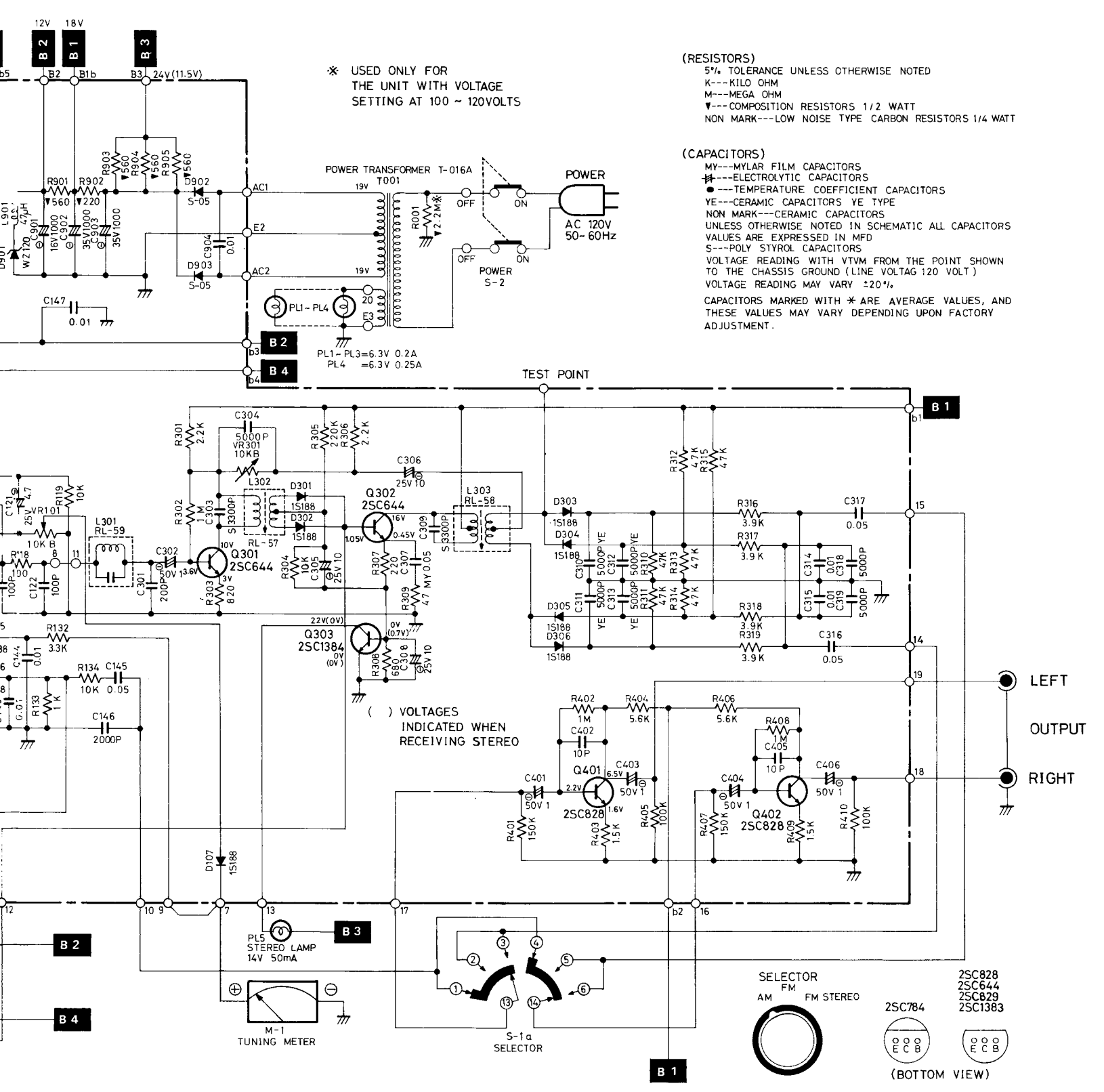

TO FUNC. SWITCH SIB(8) (ORANGE)
TO TOO1
(RED)
(RED)
(BLACK) TO TOO1
(GREY) TO TUNING METER⊖
(ORANGE) TO TUNING METER⊕
TO FUNC. SWITCH, SIA(4)
(RED) TO PL5, STEREO IND.
(YELLOW) TO FUNC. SWITCH SIA(13)
(YELLOW) TO OUTPUT JACK
(RED) TO FUNC. SWITCH
(BLACK) TO OUTPUT JACK
TO (RED) PL5 STEREO IND.
(BLUE) TO FUNC. SWITCH SIA(2)
(GREEN) TO FUNC. SWITCH SIA(5)
(WHITE) TO FUNC. SWITCH SIA(14)
(WHITE) TO OUTPUT JACK
AM OSC
AM IFT
FM IFT
FM IFT (RATIO)
MPX 38KHz
MPX 19KHz
TEST POINT
SEPARATION ADJ VR301
A FILTER

SCHEMATIC DIAGRAM



ITEM	SCHEMATIC LOCATION (LAST)
FM FRONT END	R 6
	C 18
FM IF AMP AND AM IF AMP	R 134
	C 147
FM MPX AMP	R 319
	C 319
AF AMP	R 410
	C 406

POWER TRANSFORMER	
T-016A	120V ONLY
T-016D	100V-120V
T-016E	220V-240V
T-016F	100V ONLY


12V 18V
B2 B1 B3
B2 B1b B3 24V(11.5V)
※ USED ONLY FOR THE UNIT WITH VOLTAGE SETTING AT 100 ~ 120VOLTS
(RESISTORS)
5% TOLERANCE UNLESS OTHERWISE NOTED
K---KILO OHM
M---MEGA OHM
▼---COMPOSITION RESISTORS 1/2 WATT
NON MARK---LOW NOISE TYPE CARBON RESISTORS 1/4 WATT
(CAPACITORS)
MY---MYLAR FILM CAPACITORS
---ELECTROLYTIC CAPACITORS
---TEMPERATURE COEFFICIENT CAPACITORS
YE---CERAMIC CAPACITORS YE TYPE
NON MARK---CERAMIC CAPACITORS
UNLESS OTHERWISE NOTED IN SCHEMATIC ALL CAPACITORS VALUES ARE EXPRESSED IN MFD
S---POLY STYROL CAPACITORS
VOLTAGE READING WITH VTVM FROM THE POINT SHOWN TO THE CHASSIS GROUND (LINE VOLTAG 120 VOLT)
VOLTAGE READING MAY VARY ±20%
CAPACITORS MARKED WITH ※ ARE AVERAGE VALUES, AND THESE VALUES MAY VARY DEPENDING UPON FACTORY ADJUSTMENT.
POWER TRANSFORMER T-016A
T001
POWER
AC 120V 50~60Hz
POWER S-2
PL1~PL4
PL1~PL3=6.3V 0.2A
PL4 =6.3V 0.25A
TEST POINT
( ) VOLTAGES INDICATED WHEN RECEIVING STEREO
Q301 2SC644
Q302 2SC644
Q303 2SC1384
Q401 2SC828
Q402 2SC828
LEFT
OUTPUT
RIGHT
PL5 STEREO LAMP 14V 50mA
M-1 TUNING METER
S-1a SELECTOR
SELECTOR FM AM FM STEREO
2SC784
2SC828 2SC644 2SC829 2SC1383
(BOTTOM VIEW)
B1
B2
B3
B4

PARTS LIST

Schematic Location	Part No.	Description
	RESISTORS	
R1, 303	552082122	Carbon Film, 820 ±5%, 1/4W
R2, 5, 122, R301, 306	552022222	Carbon Film, 2.2K ±5%, 1/4W
R3, 403, R409	552015222	Carbon Film, 1.5K ±5%, 1/4W
R4, 127	552022322	Carbon Film, 22K ±5%, 1/4W
R6, 113	552047122	Carbon Film, 470 ±5%, 1/4W
R101, 302, R402, 408	552010522	Carbon Film, 1M ±5%, 1/4W
R102, 309	552047022	Carbon Film, 47 ±5%, 1/4W
R103, 104, R116, 124	552056122	Carbon Film, 560 ±5%, 1/4W
R105, 308	552068122	Carbon Film, 680 ±5%, 1/4W
R106, 121	552033322	Carbon Film, 33K ±5%, 1/4W
R107, 404, R406	552056222	Carbon Film, 5.6K ±5%, 1/4W
R108, 115, R126, 133	552010222	Carbon Film, 1K ±5%, 1/4W
R109, 128, R310, 311, R312 313, R314, 315	552047322	Carbon Film, 47K ±5%, 1/4W
R110, 132	552033222	Carbon Film, 3.3K ±5%, 1/4W
R111, 118, R125	552010122	Carbon Film, 100 ±5%, 1/4W
R112, 114	552033122	Carbon Film, 330 ±5%, 1/4W
R117	552027122	Carbon Film, 270 ±5%, 1/4W
R119, 134, R304	552010322	Carbon Film, 10K ±5%, 1/4W
R120, 316, R317, 318, R319	552039222	Carbon Film, 3.9K ±5%, 1/4W
R123, 405, R410	552010422	Carbon Film, 100K ±5%, 1/4W
R129	552068222	Carbon Film, 6.8K ±5%, 1/4W
R130	552047222	Carbon Film, 4.7K ±5%, 1/4W
R131, 307	552022122	Carbon Film, 220 ±5%, 1/4W
R305	552022422	Carbon Film, 220K ±5%, 1/4W
R401, 407	552015422	Carbon Film, 150K ±5%, 1/4W
R901, 903, R904, 905	551056133	Composition, 560 ±10%, 1/2W
R902	551022133	Composition, 220 ±10%, 1/2W
VR101, 301	510502126	Potentiometer, 10KB, Meter Level Adj. & Separation Adj.
	CAPACITORS	
C1, 124, C131	440151283	Ceramic, 15pF ±10%, 250V
C2, 402, C405	440101283	Ceramic, 10pF ±10%, 250V

Schematic Location	Part No.	Description
C3, 4, 6, 9, C12, 13, 16, C101, 104, C107, 108, C110, 114, C116, 143, C144, 904	440100985	Ceramic, 0.01mfd, 250V
C5*	441151236	Ceramic, 15pF N470, 50V
C7, 112	440501388	Ceramic, 5pF ±0.5pF, 250V
C8	440151183	Ceramic, 150pF ±10%, 250V
C10*	441251230	Ceramic, 25pF NPO, 50V
C11, 113	440201388	Ceramic, 2pF ±0.5pF, 250V
C14, 17	441621236	Ceramic, 62pF NPO, 50V
C15*	441181236	Ceramic, 18pF N30, 50V
C18	440301183	Ceramic, 300pF ±10%, 250V
C102, 123, C133, 135, C136, 139, C140, 141, C142, 145, C316, 317	440500935	Ceramic, 0.05mfd, 50V
C103	440100835	Ceramic, 0.1mfd, 50V
C105, 137, C302, 401, C403, 404, C406	402100749	Electrolytic, 1mfd, 50V
C109, 134	440301388	Ceramic, 3pF ±0.5pF, 250V
C111, 305, C306, 308	402100629	Electrolytic, 10mfd, 25V
C115	402330609	Electrolytic, 33mfd, 6.3V
C117, 118, C119, 301	440201183	Ceramic, 200pF ±10%, 250V
C120, 122	440101183	Ceramic, 100pF ±10%, 250V
C121	402470729	Electrolytic, 4.7mfd, 25V
C126	442501033	Ceramic, 0.005mfd ±10%, 50V
C127	440301283	Ceramic, 30pF ±10%, 250V
C128	441301130	Ceramic, 300pF NPO, 250V
C129	440501283	Ceramic, 50pF ±10%, 250V
C130	441301336	Ceramic, 3pF N5.6, 50V
C132, 138, C146	440201085	Ceramic, 0.002mfd, 250V
C303, 309	454331033	Polystyrene Film, 3300pF ±10%, 50V
C304, 310, C311, 312, C313, 318, C319	442501033	Ceramic, 0.005mfd ±10%, 50V
C307	450500933	Mylar Film, 0.05mfd ±10%, 50V
C314, 315	450100933	Mylar Film, 0.01mfd ±10%, 50V
C901	402100419	Electrolytic, 1000mfd, 16V
C902, 903	402100439	Electrolytic, 1000mfd, 35V
	322420013	Variable, AM/FM
	490110111	Trimmer, FM OSC

* These values may vary depending upon factory adjustment.

Schematic Location	Part No.	Description
	COILS AND TRANSFORMERS	
L1	226501111	FM Antenna Matching Coil
L2, 3	226501116	FM Antenna and RF Coil
L4	226501117	10.7MHz Trap Coil
L5, 901	220001121	RF choke, 47 micro-Henry
L6	223301125	FM OSC Coil
L7	225501124	FM 1st IFT
L101	223301121	AM OSC Coil
L102	220001121	RF choke, 47 micro-Henry
L301	225601132	SCA Filter
L302	225601130	MPX 19KHz Coil
L303	225601131	MPX 38KHz Coil
T101, 102	225501116	FM IFT, 2nd & 3rd stage
T103	225501117	FM IFT, Ratio Det.
T104	225301121	AM 1st IFT
T105	225301122	AM 2nd IFT
T106	225301124	AM IFT, Det.
	TRANSISTORS AND DIODES	
Q1, 2	301201144	2SC784, FM RF amp. & FM Conv.
Q101, 102, Q103, 104, Q105	301201117	2SC829C, FM IF amp. & AM Conv.
Q301, 302	301201114	2SC644, MPX amp.
Q303	301201132	2SC1384, FM ST. Ind. driver
Q401, 402	301201115	2SC828, Audio amp.
D101, 102, D103, 104, D105, 106, D107, 301, D302, 303, D304, 305, D306	300111008	1S188, FM AGC, AM Det., MPX Dec., etc.

Schematic Location	Part No.	Description
D901	300313013	WZ-120, Zener Regulator
D902, 903	300919008	S-05, Rectifier
	119011260	Shield case for Q1
	119011261	Shield for FM RF end FM OSC
	119011262	Shield, Bottom of Front end sec.
	119011263	Shield, AM Det. sec.
	770101224	Pin, Terminal
	140300345	Printed Circuit Board "H-IF-2"
	141311350	AM/FM IF Amp. Circuit Assembly
	131011240	Cabinet
	111911270	Front Panel
	116310054	Knob, Tuning
	116310055	Knob, Selector
	116210008	Button, Power
L001	222301204	AM Antenna Coil
T001	201001341	Power Transformer, Pri. 120V
	206001341	Power Transformer, Pri. 220V & 240V
S1	601011247	Switch, Selector
S2	614010106	Switch, Power
M1	231310019	Meter, Tuning
PL1, 2, 3	351063020	Lamp, 6.3V 0.2A, Dial Light
PL4	353063025	Lamp, 6.3V 0.25A, Meter Light
PL5	351140005	Lamp, 14V 50mA, FM Stereo Indicator
R001**	551022533	Resistor, Composition, 2.2M ±10%, 1/2W
	** used only for the unit with voltage setting at 100 – 120V.	
	648211128	Bracket, Meter Light
	641200104	Antenna Terminal Strip, 4P
	624100102	Output Pin Jack, 2P
	791001119	Twin Shield Wire w/Pin plug